METEOROLOGICAL SUMMARY FOR BRAZIL, JANUARY, 1928

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The secondary atmospheric circulation was rather abnormal; low pressure showed frequency and persistence that is not normal for this period of the year. Temperatures were generally high, especially in central Brazil, where there were periods of hot weather. In this region the rains were of torrential character and caused disastrous floods in certain rivers. Strong winds accompanying the areas of low pressure swept the southern part of the country during several periods and at times assumed the proportions of tempests, especially on the coast.

Rainfall was light in the northern and central regions; the deficiencies for these regions were 1.54 and 1.77 inches, respectively. In the southern region the precipitation was irregular with an average deficiency 0.98 inch.

Abundant rainfall in central Brazil during the last decade of the month was injurious to crops. The general condition of cotton, coffee, tobacco, cereals, and vegetables is good; that of sugar cane is bad. The harvesting of sugar cane and cereals is progressing, the gathering of cacao and the picking of cotton in the northern region have been completed. The soil is being prepared for cotton, cereals, sugar cane, and tobacco.

At Rio de Janeiro the weather was generally fine with only one period of rainy weather—28th to 31st. The means for pressure and temperature were slightly below normal. The rains were about normal excepting a fall of 2.58 inches on the 28th. The winds were generally fresh, moving predominantly from the southern quadrants. The maximum wind velocity was over 36 miles per hour from the south on the evening of the 28th.

NOTES

The influence of climatic conditions on the yield of wool in Argentina.—(By Guillermo Hoxmark [translated and abstracted by G. B. Diehl]).—Argentina is one of the foremost countries in the production of wool-bearing animals. According to the 1922 census it figured as third, and was superceded only by Australia and the United States. Consequently, Argentina's production of wool is of considerable importance in the world market.

In Table 1 are given eight countries which raise the largest number of sheep, according to the census of 1922.

TABLE 1

Countries	Number of head of wool-bearing animals	Countries	Number of head of wool-bearing animals
Australia	78, 803, 261	New Zealand	22, 222, 259
United States	36, 327, 000	British India	22, 082, 353
Argentina	36, 208, 981	Great Britain	20, 621, 165
Russia	31, 911, 200	Spain	19, 377, 427

The difference between the number raised in Argentina and the United States is insignificant, and it may be said that both of these countries rank second in the production of sheep in the world.

Variations in yields are important. For example, in Buenos Aires, the shearing of 1920–21 gave 3,500 grams as the mean weight of wool, and in 1925–26 the weight of this increased to 6,882 grams, making a difference of 3,332 grams between the yields from the two shearings. In Cordoba, there is a difference between the shearings of 1920–21 and 1925–26 of 4,100 grams, in favor of the last shearing.

With a view to investigating the influence of temperature on yield, Table 2 is given, by means of which the shearing results obtained during the five-year period 1920–21 to 1925–26 are shown.

TABLE 2

Provinces and States	Mean weight of wool	Indicator numbers	Mean annual temperature
	Grams		*°C.*
Rio Negro	4, 446	1, 000	12. 7
Buenos Aires	4, 431	1, 004	15. 3
Chubut	4, 094	1, 086	10. 1
La Pampa	3, 777	1, 177	15. 3
Santa Fe	3, 262	1, 363	18. 5
Cordoba	3, 210	1, 385	17. 4
La Rioja	3, 150	1, 411	18. 9
Entre Rios	3, 148	1, 412	18. 4
San Luis	2, 716	1, 637	16. 0
Corrientes	2, 588	1, 718	19. 7
Jujuy	2, 145	2, 072	14. 7
Salta	1, 672	2, 650	18. 5
Catamarca	1, 625	2, 736	20. 6

The mean largest yield was in Rio Negro, with 4,446 grams of fleece. Based on this yield were calculated the indicator numbers which appear in Table 2, column 3, in which Rio Negro has a basic indicator of 1,000, and the remaining States and Provinces higher numbers, indicating lower yields. The mean temperatures of the respective Provinces and States will be found in column 4 of Table 2, it being evident that there is a pronounced tendency to larger yields of wool with lower temperatures.

Chubut, which has a mean annual temperature of 10.1° C., should produce more wool per animal than any other southern region of the country, but, according to the statistics, Rio Negro and Buenos Aires produce more. This contradiction is owing, perhaps, to incomplete data during the first years, because the yield in Chubut in 1924–25 is the highest registered in the country, being 6,375 grams, which seems more logical.

A study of the influence of the atmospheric elements on the yield of wool in each Province and State of the country would be too extensive, consequently we shall consider only a limited number of these, choosing Corrientes, represented by the meteorological data of Con-

cepción (lat. 28° 25′ S., long. 57° 55′ W.); La Pampa, represented by General Acha (lat. 37° 22′ S., long. 64° 32′ W.); and Rio Negro, employing the data for Choele-Choel (lat. 39° 17′ S., long. 65° 38′ W.). There are marked differences in climate between the three places mentioned, as shown by the observations of mean monthly temperature and monthly precipitation for the period 1920–1926. (See Table 3.)

TABLE 3

Stations	Mean annual rainfall	Mean annual temperature
	Millimeters	° *C.*
Concepcion (Corrientes)	1,298	20.0
General Acha (La Pampa)	485	15.2
Choele-Choe (Rio Negro)	218	15.3

The mean annual precipitation of General Acha and Choele-Choel, compared with that of Concepcion, is 37 per cent and 17 per cent, respectively, while the difference in mean annual temperature is almost 5°. (See Table 3.)

Corrientes.—A preliminary analysis shows that the mean temperatures of the months of August and September, from 1920–21 to 1925–26, have the most pronounced correlation with the yield from the shearing in Corrientes. Low temperatures for these months have the effect of decreasing the yield of wool, while high temperatures have a contrary effect, and from this we believe that if the correlation found holds for the present year one could prognosticate for the shearing of 1926–27 a mean yield of 3,100 grams.

In the case of precipitation, that for the month of June gives the highest correlation with the yield. Much precipitation in that month appears to have a bad effect on the growth of wool. The absolute lack of rainfall in June, 1925, gave the highest yield registered, compensating the farmers to a certain extent for the losses suffered in cultivated crops from dryness. (The epoch of first shearing falls in October and November and that of the second in March and April.)

La Pampa.—As a result of the investigation a very high correlation was discovered between the mean temperature of April and May and the yield of wool, the higher temperatures being associated with a diminution in yield and vice versa. This correlation is between the mean weight of wool in grams in the State of La Pampa and the mean temperature for the months named at General Acha during the period 1920–1926. (The epoch of the second shearing falls in April.)

The correlation between the yield of wool and the precipitation in the month of October during the period 1920–1926 is almost perfect. It shows that much water is an obstacle to a good yield of wool, while little rainfall in that month is the most beneficial for the growth of fleece. (The first shearing is effected in the month of November.)

Using as a base the correlation established, there is a probability of a mean yield of 4,500 grams of fleece in La Pampa as a product of the shearings of 1926–27.

Rio Negro.—In order to study the correlation in this case the meteorological data of Choele-Choel were used, although perhaps it would have been better to have taken the data of some additional stations on the basis of an average.

The temperature and precipitation in March both exercise a greater influence than the other months of the year, low temperatures giving high yields and much precipitation being favorable.

In Rio Negro the rainfall for the month of March is very small. To judge from correlations between the meteorological factors and the yield from the shearing of 1926–27 it appears very probable that there will be approximately 5,900 grams of wool from the shearing of that period. (In this State the first shearing is in December and the second in April.)

A century of temperatures in Wisconsin.[1]—In this paper the author has collected the temperature observations made at 20 stations within a radius of about 200 miles of Madison, Wis., all of which at one time or another had a record of temperature observations made concurrently with those made at Madison. Each series was reduced to the mean of 24 hours, thus eliminating irregularities due to different hours of observations.

The average difference between the Madison observations and those of the surrounding stations was used to obtain an approximate mean temperature for Madison during those years when no observations were made at that station. As a check on the accuracy of the approximated monthly means for Madison the computations were carried out for 143 months when observations at Madison were available. For those months the approximate or estimated means differed from the observed means by less than a degree in 94 months, by less than 2° in 42 months, less than 3° in 5 months, and less than 4° in 2 months. The differences among the summer months were insignificant; the differences among the winter months probably may be explained as due to differences in instrumental exposure at Madison during the years 1878–1894. The final result is a table of monthly mean temperatures at Madison for each month of the period, 1819, October to December, 1926. Lack of space prevents us from reproducing the table, but we have excerpted the monthly means of the 10 warmest and coldest seasons, respectively.—*A. J. H.*

Seasonal temperature extremes in Wisconsin for 100 years

Warmest winters (December–February)	°F.	Coldest winters (December–February)	°F.	Warmest springs (March–May)	°F.	Coldest springs (March–May)	°F.
1877–78	31.8	1874–75	9.7	1878	50.1	1843	35.6
1881–82	29.5	1884–85	10.4	1825	49.5	1857	37.9
1879–80	27.8	1903–4	11.9	1833	49.4	1867	39.1
1889–90	27.4	1831–32	12.1	1839	49.3	1837	39.6
1875–76	26.3	1872–73	12.1	1921	49.3	1888	39.9
1920–21	26.3	1892–93	12.6	1830	49.0	1892	40.4
1832–33	26.2	1855–56	12.9	1844	49.0	1850	40.5
1918–19	26.0	1822–23	13.0	1910	49.0	1869	40.5
1844–45	25.6	1917–18	13.5	1880	48.9	1885	40.6
1862–63	25.5	1886–87	13.7	1842	48.9	1907	41.2

Warmest summers (June–August)	°F.	Coldest summers (June–August)	°F.	Warmest autumns (September–November)	°F.	Coldest autumns (September–November)	°F.
1830	73.3	1915	64.3	1830	53.4	1838	43.3
1901	73.1	1842	65.9	1922	52.8	1869	43.6
1921	73.1	1869	66.2	1920	52.3	1873	43.7
1825	72.3	1903	66.3	1879	51.7	1848	44.4
1828	72.3	1848	66.4	1914	51.7	1835	44.5
1823	72.2	1924	66.5	1882	51.5	1875	44.7
1874	72.1	1902	66.6	1897	51.5	1896	44.7
1838	71.9	1836	66.8	1908	51.5	1836	44.9
1854	71.9	1884	66.8	1865	51.3	1863	44.9
1894	71.9	1904	66.8	1870	51.1	1820	45.0

Two centuries of rain in England.—Dr. J. Glasspoole in Meteorological Magazine, February, 1928, discusses the

[1] Miller, Eric R. Transactions of the Wisconsin Academy of Sciences Arts, and Letters, Vol. XXIII, pp. 165–177, 1928.

rainfall in England back to 1727. In the early years there were but two records but these seem to have afforded dependable results.

The three wettest years of the period were 1768, 1852, and 1872, with 136, 137, and 144 per cent, respectively.

There was no years so dry as 1921 with only 69 per cent since 1788. The values for the years 1731, 1741, and 1743 were equally small, but since they are based on few records the presumption is that the departures from the normal were probably in excess of the true amount.

There were nine consecutive wet years from 1875 to 1883, but the longest run of dry years was only six, viz, from 1800 to 1805. The rainfall of the recent years is remarkable in that out of the last 14 but two, 1917 and 1921, received less than the average. The rainfall of 1927 was 124 per cent of the normal and was exceeded only by eight other years in the last 200. The three years 1768, 1852, and 1872 were markedly wetter than 1927.—*A. J. H.*

Comparison of precipitation at Northfield, Vt.[2]*—Greatest amount of precipitation, as shown, 41 years*

	24 hours		2 days		5 days		Monthly	
January	2.00	1891	2.00	1891	2.35	1888	4.99	1888
February	1.97	1900	1.97	1900	2.21	1896	4.85	1909
March	3.38	1919	3.62	1919	3.66	1919	6.41	1896
April	2.15	1895	2.68	1895	3.14	1895	5.12	1920
May	2.10	1916	2.51	1916	3.01	1912	6.87	1912
June	2.22	1926	2.22	1926	2.80	1903	7.88	1912
July	3.00	1905	3.37	1905	3.42	1897	8.04	1897
August	3.22	1918	3.34	1918	3.89	1918	6.98	1890
September	3.34	1920	3.60	1920	3.92	1888	6.27	{1888 {1924
October	3.00	1912	3.69	1912	3.88	1912	5.82	1917
November *	1.91	1924	2.20	1900	2.46	1895	5.68	1895
December	2.14	1887	2.33	1887	2.63	1895	5.88	1887
November	♭7.72	1927	8.40	1927	8.74	1927	11.42	1927

[2] Of,. November floods in New England and eastern New York this Review, 55: 496–499.

* Previous to 1927.

♭ The 24-hour precipitation on Nov. 3–4, 1927, was a little more than twice as great as had occurred in the previous 41 years.

—*W. A. Shaw.*

The problems of polar research.[1]—This volume of 479 pages contains 31 papers by recognized authorities on the various problems intimately associated with polar research. It fills the need of an up-to-date inventory of the results achieved by former explorers and offers a definite outline of the remaining unsolved problems.

The guiding principle in preparing the papers was not to emphasize either past achievements or heroic adventure but rather to concentrate on the major problems remaining to be solved by further field study, where and by what means these problems may best be attacked, and what manner of cooperation between the sciences most concerned may yield the greatest harvest of results.

It is of course not practicable in the space available to do justice to each of the 31 papers; I therefore content myself with presenting a table of authors and titles as below.

Contents of American Geographical Society's special publication No. 7

Group and author's name	Title of paper
Oceanographic:	
Fridtjof Nansen	The Oceanographic Problems of the Still Unknown Arctic Regions.
Erich von Drygalski	The Oceanographic Problems of the Antarctica.
H. A. Marmer	Arctic Tides.
Sir Douglas Mawson	Unsolved Problems of Antarctic exploration and Research.

[1] American Geographical Society, Special publication No. 7, edited by W. L. G. Joerg.

Contents of American Geographical Society's special publication No. 7—Continued

Group and author's name	Title of paper
Geological:	
A. P. Coleman	Unsolved Geological Problems of Arctic America.
I. P. Tolmachev	The Geology of the Arctic sea, Eurasia and Its Unsolved Problems.
R. E. Priestley and C. S. Wright.	Geological Problems of Antarctica.
Meteorology:	
H. H. Clayton	The Bearing of Polar Meteorology on World Weather.
Sir Frederic Stupart	The Influence of Arctic Meteorology on the Climate of Canada Especially.
Griffith Taylor	Climatic Relations between Antarctica and Australia.
Jules Rouch	The Meteorology of the American Quadrant of the Antarctic.
Ice problems:	
N. A. Transehe	The Ice Cover of the Arctic Sea, with a Genetic Classification of Sea Ice.
A. Kolchak	The Arctic Pack and the Polynya.
R. E. Priestley and C. S. Wright.	Some Ice Problems of Antarctica.
Robert A. Bartlett	Ice Navigation.
Ethnology:	
Diamond Jenness	Ethnological Problems of Arctic America.
Waldemar Bogoras	Ethnographic Problems of the Eurasian Arctic.
Knud Rasmussen	Tasks for Future Research in Eskimo Culture.
Terrestrial magnetism:	
L. A. Bauer	Unsolved Problems in Terrestrial Magnetism and Electricity in Polar Regions.
Plant geography:	
John W. Harshberger	Unsolved Problems in Arctic Plant Geography.
Zoogeography:	
Leonhard Stejneger	Unsolved Problems of Arctic Zoogeography.
R. N. Rudmose Brown	Antarctic and sub-Antarctic Plant Life and Some of Its Problems.
Robert Cushman Murphy.	Antarctic Zoogeography and some of Its Problems.
Resources:	
Vilhjalmur Stefansson	The Resources of the Arctic and the Problems of Their Utilization.
Political Rights:	
David Hunter Miller	Political Rights in the Polar Regions.
Air Navigation:	
O. M. Miller	Air Navigation Methods in the Polar Regions.
Richard E. Byrd	Polar Exploration by Aircraft.
Geo. H. Wilkins	Polar Exploration by Airplane.
Lincoln Ellsworth	Arctic Flying Experiences by Airplane and Airship.
Umberto Nobile	The Dirigible and Polar Exploration.
Separate Illustration	Bathymetric Map of the Arctic Basin by Fridtjof Nansen revised to 1927. Scale 1 : 20,000,000.

Considering the group of papers on meteorology of the polar regions, a subject with which the present reviewer is more or less familiar, it may be said that the casual reader is apt to infer that the meteorology of the Antarctic is better known than that of the Arctic. That inference is not justifiable, although it is a fact that the observational material for the Arctic is much greater than for the Antarctic.

The failure to discuss the material for the Arctic is difficult of explanation except on the ground that the

observations were made about 40 years ahead of their time. Take, for example, the International Polar Observations of 1882–83. These have not been studied en masse and are perhaps mostly forgotten by meteorologists of the present generation. One is reminded of Professor Schuster's dictum, viz, that it would be a good thing for meteorology if the making of observations should be suspended for five years and the energy thus saved devoted to the study of observations already made.

In extenuation of the failure to discuss the observations above named, it should be remembered that in the early eighties the northern limit of the field of observation in the Northern Temperate Zone did not extend much, if any, above north latitude 55°, thus leaving a broad band of terra incognita, meteorologically speaking, between the very high latitude stations of the International Polar Observations and those of the North Temperate Zone. The same series of observations if made at present would have a much greater value than they now have.—*A. J. H.*

Manual of Meteorology, Volume II, Comparative Meteorology (by Sir Napier Shaw; Cambridge University Press, London, The Macmillan Co., New York, 1928).—Meteorologists are to be congratulated on the fact that the outstanding exponent of meteorological facts and theories among English-speaking peoples—Sir Napier Shaw, drawing upon his own knowledge and experience and having at his command that rich store of material to be found only in the British Meteorological Office—has taken the time and trouble to write a manual of meteorology for the use of present and unborn generations of men and women.

Volumes I and IV have already appeared. The explanation of why Volume IV appeared before Volume I is found in the fact that the material of that volume had a very direct bearing upon the military operations in the World War. It was printed in 1919, although the material had been assembled at an earlier date.

Volume I, Meteorology in History, came out in 1926 and the volume under review was printed in early 1928.

After presenting a very full history of the science from Aristotle's time up to the present in Volume I, Sir Napier presents in Volume II not only the nature and extent of the material that is available to the meteorological student but also his own conception of the larger problems of meteorology. The work is profusely illustrated by 225 maps and diagrams. It may be said of these that in view of the limitations imposed by the size of the volume (the letter-press is 19 by 12¼ cm.), an excellent presentation is made, although a few of the diagrams approach dangerously near to indistinctness owing to the reduction that was necessary. The major achievement, however, is the presentation, for the first time, of maps of both Northern and Southern Hemispheres having a diameter of but 14½ cm.

It is quite impossible, in the available space in this REVIEW, to more than browse around in the 10 chapters which make up the volume.

Chapter I deals with the influence of sun and space. Sir Napier recognizes that the fundamental causes of variations from the normal circulation are to be sought, in solar and terrestrial radiation, yet he is careful to point out that the details of the physical processes by which, for example, radiation is related quantitatively to temperature or its possible alternative vapor pressure are still in the stage of development that belong rather to the meteorological laboratory than to the normal observatory and accordingly the detailed consideration of the subject must be postponed for the present. He presents as useful working data A. Angot's distribution of solar energy which would reach unit area of receiving surface at right angles to the sun's rays at the outer limit of the atmosphere. The week is the time unit used.

Chapter II, 26 pages, deals with the distribution of land, water, and ice, orographic features, and other geophysical agencies, and Chapter III with the composition of the atmosphere.

Chapter IV, 83 pages, is devoted to temperature; the monthly mean values are chosen as the basis of presentation. A set of monthly and annual maps of normal temperature at sea level, 26 maps in all, are figured and these are supplemented by maps of the average daily range of temperature throughout the year and also the normal temperature within the cycle of the seasons in different parts of the world.

A space of about 4¼ by 14 cm. is available under each hemispherical map. These spaces have been utilized for the presentation of some of the multitudinous facts about average conditions of temperature.

The temperature of the free air is naturally treated in less detail by reason of insufficient data. The chapter concludes with a bibliography as do several others.

Chapter V, 82 pages, is devoted to a discussion of the problems that arise in relation to the vapor content of the atmosphere and condensation thereof in the form of rain or snow. The vertical distribution of water vapor is considered as is also evaporation from land and water surfaces as measured at many stations over the globe A table of observed annual values is given.

Chapter VI, 79 pages, is devoted to a consideration of pressure and winds. In this chapter barometric observations in all parts of the world are represented by maps of normal monthly isobars or lines of equal pressure. Owing to the well-known relation between the wind and the pressure distribution, the normal conditions as to wind or the normal resultant flow of air is easily recognized.

Then follows a discussion of the general relation of winds to the isobars and thus to some general ideas of the circulation of air over the globe. Trade winds and monsoon winds are discussed in some detail. Sir Napier, rightly we believe, frowns upon the practice of some writer not all of whom reside on the other side of the Atlantic, of applying the term "monsoon" indiscriminately to any wind that has a seasonal variation. He says:

> It is an unnecessary and an unfortunate habit, not only because the name "monsoon" has been attributed from the very earliest times to part of a certain definite cyclonic circulation, but also because practically everything meteorological is seasonal, but is not on that account monsoonal.

The sixth chapter completes the picture of the normal general circulation of the atmosphere and its seasonal variations. In the remaining chapters the author turns his attention to the changes disclosed by differences in the values from which the means of the several months have been obtained.

Chapter VII, 49 pages, discusses changes in the general circulation resilience or plasticity, in which the ideas of plasticity and resilience of the circulation is developed.

From one point of view the circulation may be looked on as a plastic structure which, like clay, can be molded by the external influences that are operative from time to time. It may be supposed to have no resilience but simply a capacity for taking the impress of disturbing causes. The other point of view depends ultimately on the idea that the circulation as a whole is a resilient struc-

ture. It may be disturbed by any temporary exceptional cause such as some peculiarity of the orbits of the sun, moon, or planets, a change in the solar energy, or a loss of transparency of the atmosphere on account of dust or carbonic-acid gas, an accumulation of ice in the polar region, or a recession of the glaciers of lower latitudes, and so on, when the temporary cause is removed and the conditions are restored to normal (if that be possible) the circulation will, in virtue of resilience, recover its normal condition; but it may oscillate about the normal in some period or periods of its own before resuming the normal state. * * * Both of these ideas are fully developed.

Chapter VIII, 35 pages, discusses the transitory variations of pressure cyclones and anticyclones, and that section is followed by a discussion of the structure of cyclonic depressions in which some of the newer views find place.

Finally Chapter X, 20 pages, on the earth's atmosphere brings to a close Sir Napier's exposition of the structure of the earth's atmosphere, the general circulation, and its variations of long or short period. This chapter forms in his own words "the brass plate, bell pull, and knocker of the house which is to be represented by the remaining volumes."

No student of meteorology can afford to be without this manual.—*A. J. H.*

February weather in the United States 50 years ago.—The month was characterized by very low atmospheric pressure in Pacific Coast States and adjoining oceanic areas, the large number of rainstorms that came in from the Pacific, damaging floods in Pacific Coast States, dry weather east of the Rockies, high temperatures in the interior of the continent, and stormy weather in the Atlantic off the Virginia and North Carolina coast. A few tornadoes occurred in the Gulf States. On the whole, great diversity in the weather ruled.—*A. J. H.*

BIBLIOGRAPHY

C. FITZHUGH TALMAN, in Charge of Library

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

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